

# An Evaluation of Obstetrical Analgesia

HARRY S. FIST, M.D., Los Angeles

OBSTETRICAL ANALGESIA should keep pain at a minimum and avert fatigue and shock yet not interfere with the ability of the patient to cooperate in delivery; and the method should be safe when used by the average general practitioner. It must control pain during the first stage of labor and the beginning of the second, anesthesia being added during the actual expulsion of the child and repair of the perineum.

Progressive muscle relaxation as advocated by Grantly Dick Read is one step toward relief of pain in labor but it cannot replace the action of the drugs modern science has provided.

Factors other than the choice of drugs influence the condition of mother and baby at delivery. The infant may be affected by prematurity, congenital deficiency, uncleared respiratory passages, umbilical cord blockage, birth pressure and the trauma of difficult or rapid forceps delivery, version or breech extraction.

Anoxia causes irreversible changes in the fetal brain tissue<sup>26</sup> and is the chief cause of stillbirths and neonatal morbidity and mortality.<sup>16</sup> Drugs which increase anoxia must be avoided.

Herewith, a brief resume of some of the drugs used for analgesia:

*Morphine*, a powerful analgesic agent that depresses the central nervous system, is especially dangerous in obstetrics, for it interferes with the initiation of fetal respiration. Morphine given to the mother narcotizes the fetus in about 30 minutes and the effect usually lasts three or four hours.<sup>25</sup> Babies delivered less than four hours after administration of morphine are limp and livid and reflexes are absent. Twenty minutes of resuscitative efforts restore reflexes in slight degree only. Cyanosis and apnea persist as long as eight hours. Recovery takes eight to twelve hours. Carbon-dioxide inhalation helps recovery, but this drug should be administered only for momentary periods.<sup>8</sup>

Most clinicians agree that morphine or its derivatives should not be given if labor is to terminate within three hours or if the infant is premature.<sup>27</sup> Since length of labor cannot be foretold, morphine is contraindicated. It is the least safe of the analgesics, and its use has been almost discontinued.

*• Relief of pain and safety of mother and child are fundamentals in obstetrical analgesia. Elimination of those drugs which are ineffective or dangerous is the best guide to proper medication. Morphine, codeine, or similar opium derivatives should be avoided as they depress fetal respiration. Barbiturates have the same fault, despite their popularity.*

*Demerol in small dosage is safe and effective. Scopolamine yields excellent results with safety. Magnesium sulfate potentiates and reinforces the action of scopolamine and involves no danger. This combination of drugs may be used by any competent general practitioner in the home or hospital.*

---

*Codeine* resembles morphine but is less nauseating and less constipating. While it causes only one-fourth as much respiratory depression as is caused by an equal amount of morphine, the dose required for analgesia is four times as great.

*Dilaudid* is ten times as analgesic but only four times as somnifacient as morphine. In adequate dosage it depresses the respiratory reflexes almost as much as does morphine. It has been reported to have little depressant effect.

*Pantopon* has the same action as morphine, and in equivalent doses causes the same respiratory depression.

*Meperidine (Demerol®)* is a synthetic drug with properties related to the atropine and morphine compounds. It has very little depressant action and is therefore more desirable for use in obstetrics. Given early, Demerol provides psychic sedation through its analgesic effect, thus reducing excitement and enhancing amnesia.

Although it depresses respiration a little, Demerol-scopolamine has been given intravenously during labor with good results.<sup>3</sup> The vagodepressive action of Demerol gives it spasmolytic effect.<sup>22</sup> In analgesic potency it is midway between codeine and morphine. It does not weaken uterine contractions or prolong labor. It differs from morphine in that it relaxes smooth muscles. Demerol in doses of 100 mg. or less may be considered one of the safer drugs. However, when the mother also receives barbiturates, neonatal asphyxia increases.

Presented before the Section on General Practice at the 82nd Annual Session of the California Medical Association, Los Angeles, May 24 to 28, 1953.

*Barbiturates* are soporific, not analgesic. In the absence of pain, they tend to cause sleep within half an hour. Large doses in the presence of pain cannot be depended upon for sedation and are likely to cause delirium and restlessness.<sup>6</sup>

Sodium pentothal and other barbiturates induce excitement; they have low analgesic power and, owing to restlessness of the patient, increase the hazard of laceration. When they are used, more nursing care is needed.

Barbiturates, since they depress the higher nerve centers, especially those of respiration, decrease the rate and sometimes disrupt the rhythm of breathing.<sup>9</sup> They pass freely through the maternal circulation and the placenta, causing fetal somnolence, flaccidity and bradycardia.<sup>7</sup> Given to a mother near the end of the second stage of labor, they interfere with the initiation of infant respiration almost as much as does morphine. Narcosis in the child following the use of pentobarbital sodium persists as long as eight hours postpartum. A combination of pentobarbital sodium and morphine causes more respiratory depression than does either given alone.

In deep barbiturate narcosis the inhalation of carbon dioxide does not stimulate respiration.<sup>30</sup>

In experiments on animals it was noted that predisposition to shock was greater when barbiturates were given than when other drugs were used.<sup>20</sup>

When barbiturates are given beforehand, the depression of respiration may be serious if labor is prolonged or extensive operation is necessary.<sup>25</sup> Repeating the dosage time after time is especially dangerous. Intravenous administration of barbiturates is by far the most dangerous method, as the amount needed for anesthesia is half to three-fourths the fatal dose.

Giving barbiturates after ingestion of food tends to cause vomiting and resultant aspiration pneumonia, pentobarbital sodium being the worst offender.<sup>11</sup> Edema of the lungs is also a frequent complication. Barbiturates diminish reflex responses and are contraindicated when the patient has infection of the upper or lower respiratory tract.

Barbiturates cause a decrease in prothrombin in the blood of mother and child.<sup>5</sup> It has been suggested that to prevent hepatic damage, carbohydrates and protein be given with barbiturates, and fats restricted. Previous sensitization is a positive contraindication to barbiturates in labor.

Barbiturate poisoning is marked by excitability followed by coma, pronounced decrease in blood pressure and depression or paralysis of respiration. Antidotes, such as picotoxin, are directed mostly toward overcoming respiratory depression.

*Scopolamine* is the best amnesic available. It is safe and it provides psychic sedation and a dry un-

obstructed respiratory tract. It prevents the carotid sinus syndrome of vagal type characterized by bradycardia, lowered arterial tension and decreased pulse pressure. It relieves bronchospasm and laryngospasm. It combats cortical respiratory depressants.<sup>28</sup> It dilates the pupils and accelerates the pulse but induces no change in fetal respiration or in other fetal vital functions.

When given with morphine, scopolamine has the harmful action of morphine. When it is given alone, however, the few infants who are moderately asphyxiated are readily resuscitated and respiration thereafter is maintained without difficulty.

Scopolamine in doses much larger than are recommended for twilight sleep has no hazardous effect on blood pressure or respiration. There is no pharmacologic evidence that scopolamine adds to fetal asphyxia.

For years Van Hoosen administered scopolamine with no ill effects although she gave as many as nine doses of 0.6 mg. each during 24 hours of labor. She reported: Soft parts relaxed; acute pain absent; first stage shortened; mother's strength conserved; delivery of the head facilitated, resulting in less laceration; better milk secretion; and absence of shock or fatigue. Hemorrhage was rare and convalescence rapid.<sup>20</sup>

Ever since the "stable" scopolamine has been available, restlessness has not been a problem and the so-called "idiosyncratic response" to scopolamine is a rarity.

Magnesium sulfate, given in doses of 2 cc. of 50 per cent solution to each injection of 0.6 mg. of scopolamine, is synergistic and greatly quiets the patient.<sup>2</sup>

Under scopolamine, the patient sleeps between pains or talks quietly, sometimes picking imaginary objects out of the air. The throat and mouth are dry and the face flushed, and the pulse may be rapid. The patient is conscious and can bear down when necessary. Amnesia is complete and the patient is rested on awakening. No cyanosis, asphyxia or fetal mortality may be ascribed to the drug. Labor is shortened and the loss of blood is minimal.<sup>14</sup> Uterine contractions are usually increased and bearing down is automatic when the head of the infant is on the perineum.<sup>24</sup> Scopolamine is a safe, efficient and highly desirable drug for the induction of analgesia.<sup>17</sup>

*Magnesium sulfate* was used experimentally in 1905 for induction of anesthesia in various kinds of animals. Doses of 1.5 gm. per kilogram of body weight, in 25 per cent solution, were injected subcutaneously. No excitation was observed in any of the experiments. The animals could be operated

upon without any sign of pain or resistance although they were still able to move about somewhat.<sup>18</sup>

In 1915 it was reported that when magnesium sulfate and scopolamine were given together, there was true potentiation of the action of each, the analgesic effect was increased and restlessness was lessened.<sup>13</sup>

Magnesium sulfate has been used successfully as a powerful sedative in tetanus, chorea and other motor excitation. It has been given intravenously in fairly large doses in the treatment of eclampsia. The author has given fifteen injections daily of 20 cc. of 10 per cent solution, with no demonstrable ill effects. Irving<sup>12</sup> reported that he gave 10 to 20 cc. of 50 per cent solution intramuscularly every four to six hours in treatment of eclampsia. Owing to the local anesthetic action of magnesium sulfate, intramuscular injection causes very little discomfort.

Magnesium sulfate has comparatively little effect on the heart. It lessens excitability of the vagus. Intravenous injection lowers the blood pressure, mainly through vasodilatation. It causes no fetal depression and is safe for obstetrical use.

*Paraldehyde* is fundamentally similar to alcohol in action. Its hypnotic effect is stronger and occurs sooner. The sleep it induces is normal. Irritating to the mucous membranes of the throat and gastrointestinal tract, it causes vomiting in many cases. Given rectally, it is irritant to the rectal mucosa and is often expelled. It has been given intravenously. It increases the pulse rate but does not have cardiac depressant effect on mother or baby. When given with morphine it is quite toxic. It should not be given with sodium amytal or pentobarbital, for they are respiratory depressants. If given early, paraldehyde often causes uterine inertia. In late labor, pressure of the head of the baby on the perineum causes so much restlessness in patients that have been given paraldehyde that restraint often is necessary. Necrosis frequently occurs at the site of intramuscular injection. Definite depression of vital fetal functions and delay in the initial postpartum cry have been reported. Pulmonary hemorrhage has occurred in several cases.

Paraldehyde is contraindicated if general anesthesia is to be used, or if bronchopulmonary disease or gastroenteritis is present.

Although fairly successfully employed in some clinics, paraldehyde is not very widely used.

*Caudal block* is of great merit for relief of labor pain. If it is used throughout labor, additional personnel is necessary. No increase in nursing care is required, however, for caudal anesthesia in the terminal stage, and it is safe and satisfactory for delivery of the baby and repair of the perineum.<sup>10</sup> When used at the end of first and second stage analgesia, it

affords very nearly ideal relief of pain. Caudal block should always be administered by an expert. Knowledge of the anatomy and the technique of insertion of the needle is necessary, as is preparation for emergency, such as a fall in blood pressure.

*Spinal anesthesia* is also of merit for delivery and repair. However, about ten per cent of patients have headache after spinal anesthesia.

*Local anesthesia* is safe and may be used when delivery is carried out at the home of the patient, with or without forceps. It requires no complicated apparatus, and may even be used during repair of laceration. However, since it lasts only an hour or so, it should not be used for first stage analgesia.

*Hypnotism* is safe, simple, and fairly effective. It requires a knowledge of the technique. Only about 20 per cent of normal adults can be hypnotized deeply, but a larger percentage of patients receive much relief and the first stage of labor is shortened an average of two hours.<sup>1</sup> It is not very effective unless the hypnotist is in constant attendance throughout labor.

*Inhalation anesthesia* is not satisfactory during the first stage of labor or for long periods.

Ether is slower in action than nitrous oxide or chloroform, but is safer. It is a heart stimulant. It lessens the strength and frequency of uterine contractions. Anesthesia by colonic infusion of ether is less easily controlled than anesthesia by inhalation, and the method frequently causes proctitis and diarrhea. Patients anesthetized by ether may be restless and delirious. The fetus is somewhat anesthetized by ether from the circulation of the mother.

Chloroform is more widely used in England than in this country. While it is more rapid in action than ether, the margin of safety is not as wide and the danger signals not as forthright. It is a depressant and may cause sudden death or delayed hepatic damage. In the hands of an expert, it may be invaluable for relaxing the uterus but it should never be administered by anyone less than expert.

Nitrous oxide is pleasant for the patient and rapid in action. It should not be given over long periods. Since anoxia occurs if there is not enough oxygen in the inhaled gas and analgesia is inadequate if the proportion of oxygen is too high, it has been suggested that a definite mixture, 80 per cent oxygen and 20 per cent nitrous oxide, be used.

Cyclopropane and ethylene are said to cause little or no narcosis of the infant unless deep anesthesia is used for operative delivery. Cyclopropane, however, depresses fetal respiration and is inflammable and explosive.

Trilene shows much promise. In England it has largely replaced chloroform. It can be administered

by the patient with safety, and the effects on the baby, even after long administration, are slight.<sup>21</sup>

*The author's method*,<sup>4</sup> first reported in 1930 and used continuously since that time with but slight change, is as follows:

When contractions are regular and strong, inject the following drugs deeply into the buttocks with a 5 cc. syringe, using precautions against intravenous injection: Demerol, 100 mg., scopolamine hydrobromide (Burroughs Wellcome) 0.6 mg., magnesium sulfate 50 per cent solution, 2 cc., and Synkayvite, 10 mg. Half an hour later inject: Scopolamine hydrobromide, 0.3 mg. and magnesium sulfate 50 per cent solution, 2 cc. Repeat this second dosage hourly as needed. The Demerol may be omitted if pains are weak or delivery is imminent.

Sideboards should be placed on the bed to keep the patient from rolling out during sleep. The patient should be closely watched and at intervals should be urged to urinate.

When the head of the baby is on the perineum and dilation is complete, oxygen inhalations should be started and anesthesia given for the period of delivery and repair. Caudal block, spinal anesthesia or other methods may be used.

With this regimen the patients are quiet and somnolent and amnesia is good. Cervical dilatation is normal. Uterine contractions are not decreased. Excitement is rare. Since none of the drugs used depresses fetal respiration, the babies cry spontaneously; rarely is resuscitation needed. Gentle "milk-ing" of the trachea removes any thick mucus that may be present.

8712 Wilshire Boulevard.

#### REFERENCES

1. Abramson, M., and Heron, W. I.: An objective valuation of hypnosis in obstetrics, *Am. J. Ob. and Gyn.*, 59:1061-1074, May 1950.
2. Beckman, H.: *Treatment in General Practice*, p. 742-745, 1934.
3. Brown, J. M., Volpitte, P. P., and Torpin, R.: Intravenous Demerol-Scopolamine during labor, *Anes.*, 10:15-24, Jan. 1949.
4. Fist, H. S.: Obstetrical analgesia, *Calif. & West. Med.*, 32:331, 1930.
5. Fitzgerald, J. E., and Webster, A.: Obstetrical significance of barbiturates and vitamin K, *J.A.M.A.*, 119:1082, Aug. 1, 1942.
6. Fritsch, J. E., and Brown, R.: Barbiturates in primiparous labor, *Am. J. Obs. and Gynec.*, 29:700, May 1935.
7. Galloway, C. E., Grier, R. N., and Blessing, R.: Pentobarbital-sodium and scopolamine hydrobromide, *J.A.M.A.*, 107:1707, Nov. 21, 1936.
8. Henderson, Y.: Narcotic asphyxia in the newborn, *Am. J. Obs. and Gynec.*, 37:521-522, March 1939.
9. Henderson, Y.: Respiratory stimulants and their uses, *J.A.M.A.*, 108:471-475, Feb. 6, 1937.
10. Hingson, R. A., and Edwards, W. B.: Continuous caudal anesthesia during labor and delivery, *Anes. and Anal.*, 21:301-311, Nov.-Dec. 1942.
11. Irving, F. C.: Barbiturates in obstetrics, *R. I. Med. J.*, 28:493-496, July 1945.
12. Irving, F. C.: Treatment of eclampsia, *Am. J. Obs. and Gynec.*, 54:731-737, Nov. 1947.
13. Issekutz, B.: Über die Kombinierte Wirkung des Magnesiumsulfats mit Verschiedenen Narkotika, *Therap. Monatsch.*, 29:379-384, July 1915.
14. Kirschbaum, H. M.: Scopolamine in obstetrics, *Am. J. Obs. and Gynec.*, 44:664-672, Oct. 1942.
15. Krebs, O. S., Wulff, G. L., and Wasserman, H. C.: Scopolamine semimarcosis with modifications, *J.A.M.A.*, 107:1704-1707, Nov. 21, 1936.
16. Litchfield, H. R., and Beilly, J. S.: Asphyxia of the newborn, *Med. Annals Dist. Col.*, 7:307-313, Oct. 1938.
17. Lull, C. B.: Analgesia and anesthesia in obstetrics, *Wisconsin Med. J.*, 49:374-376, May 1950.
18. Meltzer, S. J., and Auer, J.: General anesthesia by subcutaneous injection of magnesium salts, *Am. J. Physiol.*, 13:366-388, 1905.
19. Montgomery, T. L.: The use of analgesics in labor, *Anes. and Anal.*, 19:341-344, Nov. and Dec., 1940.
20. Moon, V. H.: *Shock and Related Capillary Phenomena*, pp. 152-153, Oxford University Press, 1938.
21. Pask, E. A.: Obstetric analgesia, *Practitioner*, London, 166:149, Feb. 1951.
22. Paton, C. N.: Anesthesia in labour and caesarean section, *Med. J. Austral.*, 2:589-592, Nov. 15, 1947.
23. Rosenfield, H. H., and Davidoff, R. B.: New procedure for obstetrical analgesia, *N.E.J.M.*, 207:366-368, Aug. 25, 1932.
24. Rucker, M. P.: The action of various anesthetics on uterine contractions, *Anes. and Anal.*, 5:235-246, Oct. 1926.
25. Russ, J. D., and Strong, R. A.: Resuscitation of asphyxiated newborn infant, *Am. J. Dis. Child.*, 61:1-12, Jan. 1941.
26. Schreiber, F.: Apnea of newborn, *J.A.M.A.*, 111:1263-1269, Oct. 1, 1938.
27. Snyder, F. F., and Geiling, E. M. K.: Morphine in obstetrical analgesia, *Am. J. Obs. and Gynec.*, 45:604-613, April 1943.
28. Sollman, T.: *Manual of Pharmacology*, p. 377, 1942.
29. Van Hoosen, B.: Scopolamine-Morphine Anesthesia, *The House of Manz*, Chicago, 1915.
30. Windle, W. F., and Becker, R. F.: The role of carbon-dioxide in resuscitation, *Am. J. Obs. and Gynec.*, 42:852, Nov. 1941.